

# Grassroots Platforms: Beyond Decentralisation

DeTaP Workshop, AFT 2026

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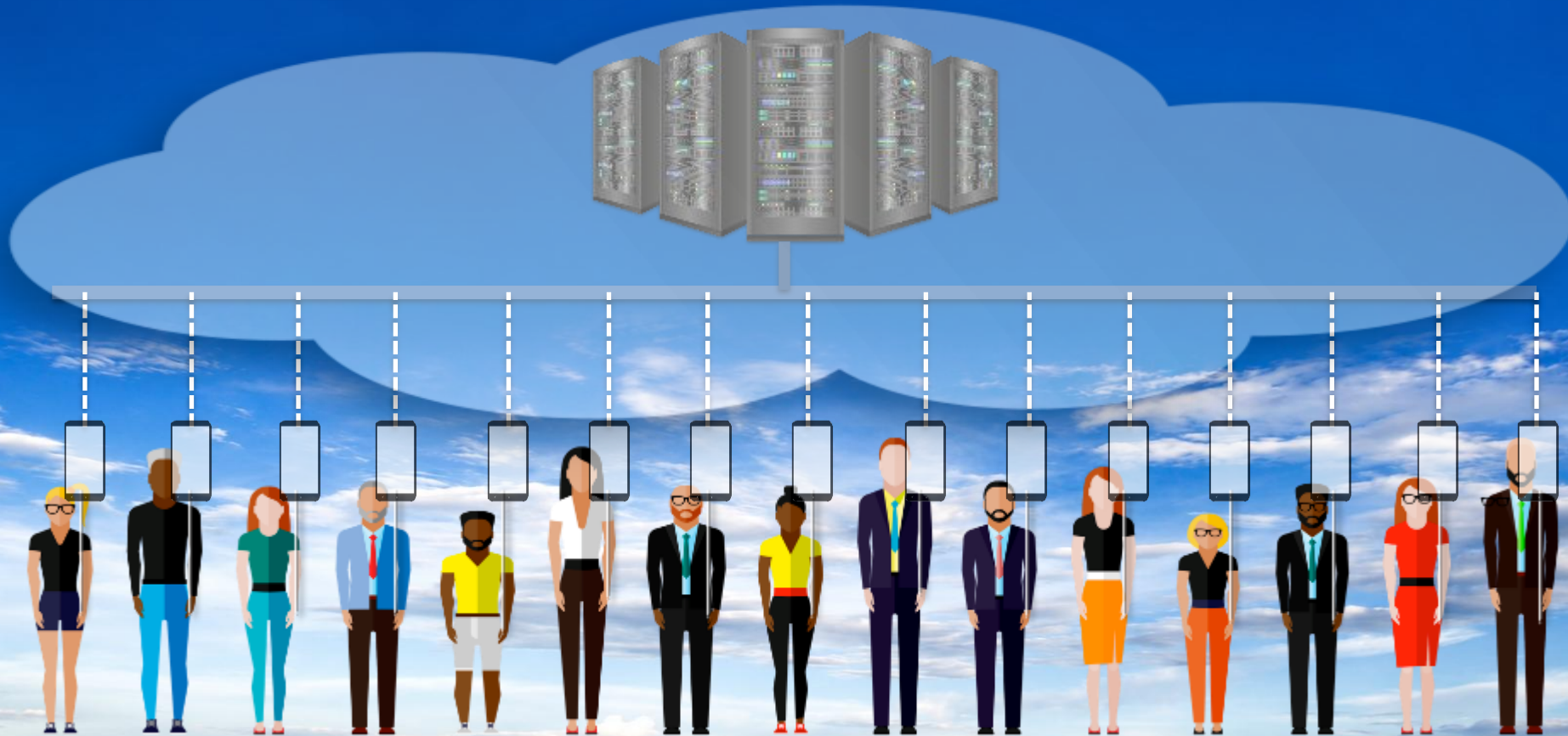
# Global Platforms – Centralised



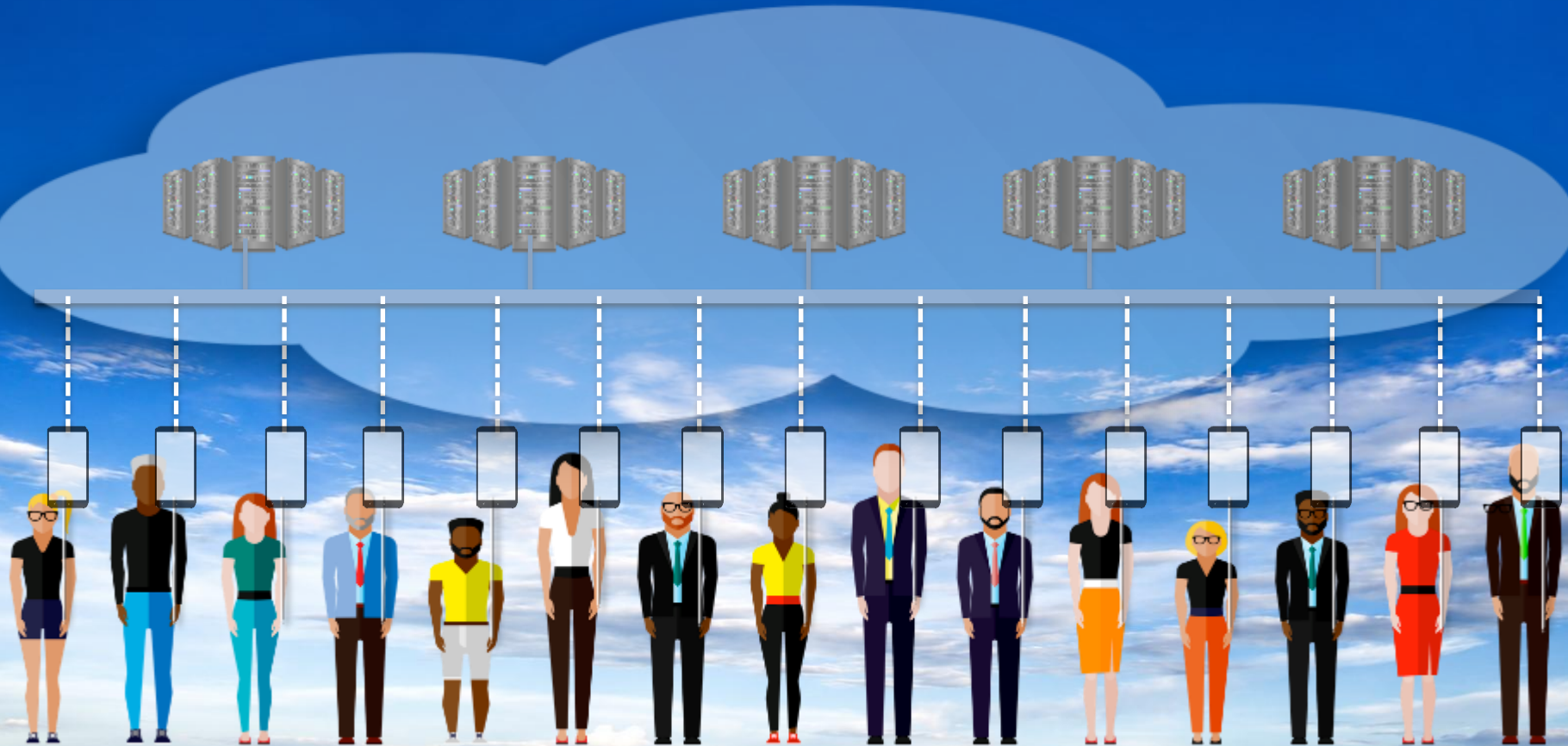
# Global Platforms – Decentralised



# Global Platforms



# Global Platforms

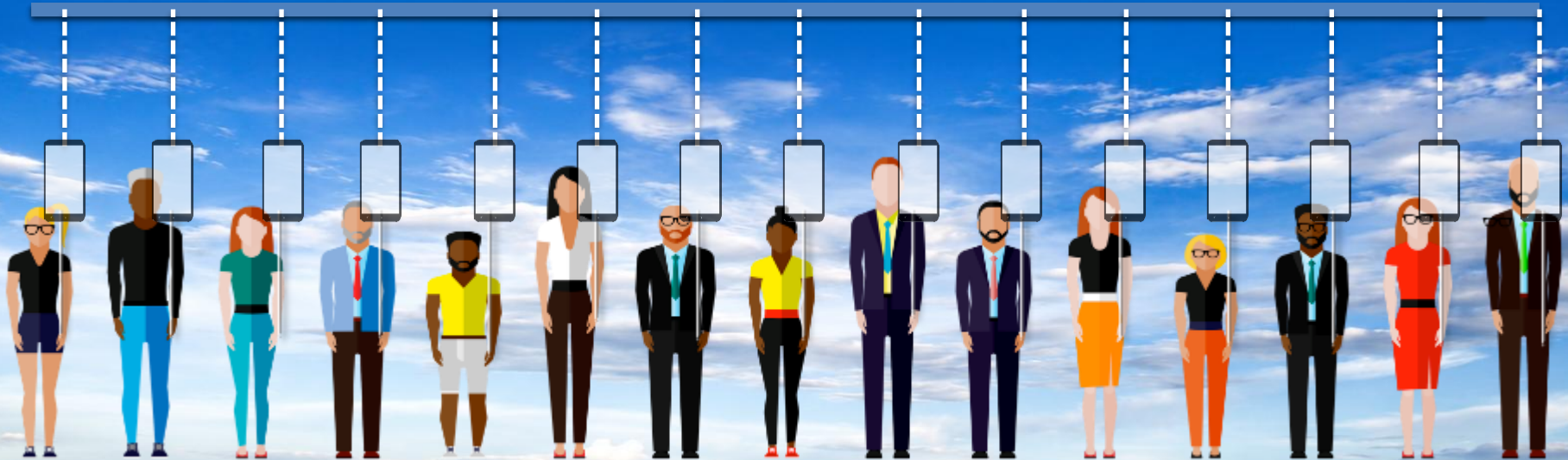


# Global Platforms

monolithic entity  
owned, operated and governed by others

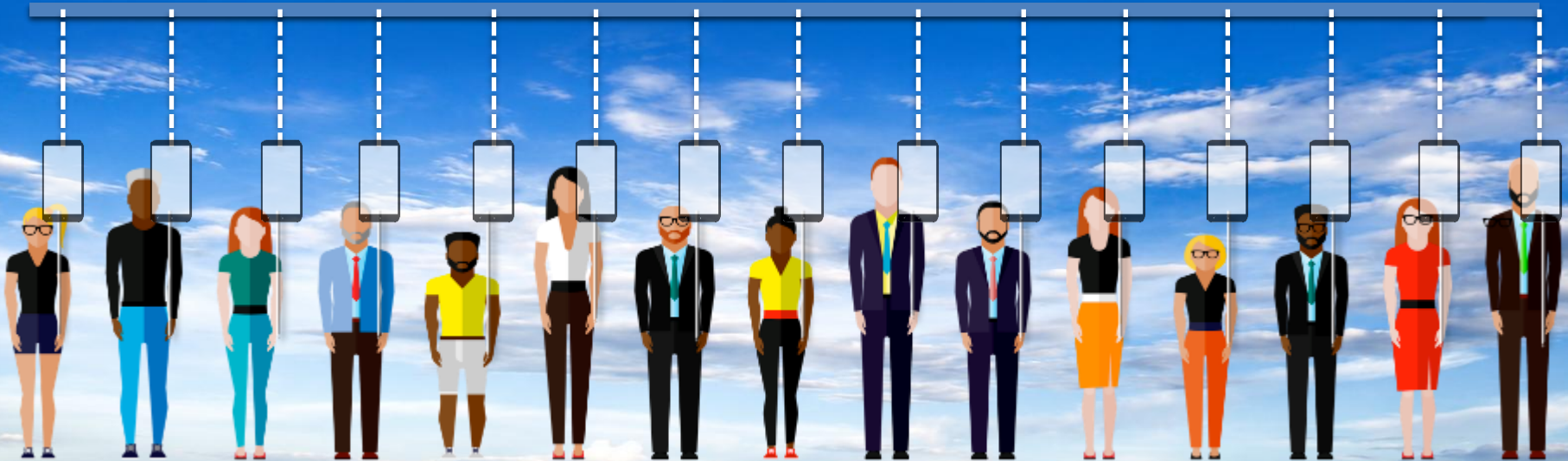


# Grassroots Platforms



# Grassroots Platforms

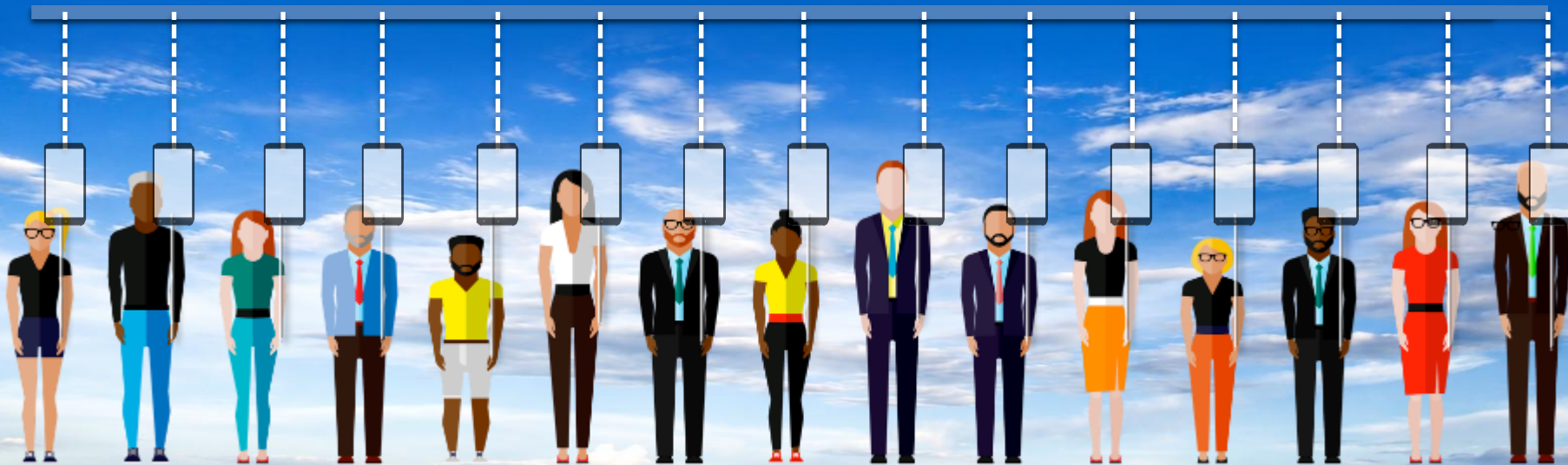
owned, operated and governed by their participants



# Grassroots Platforms

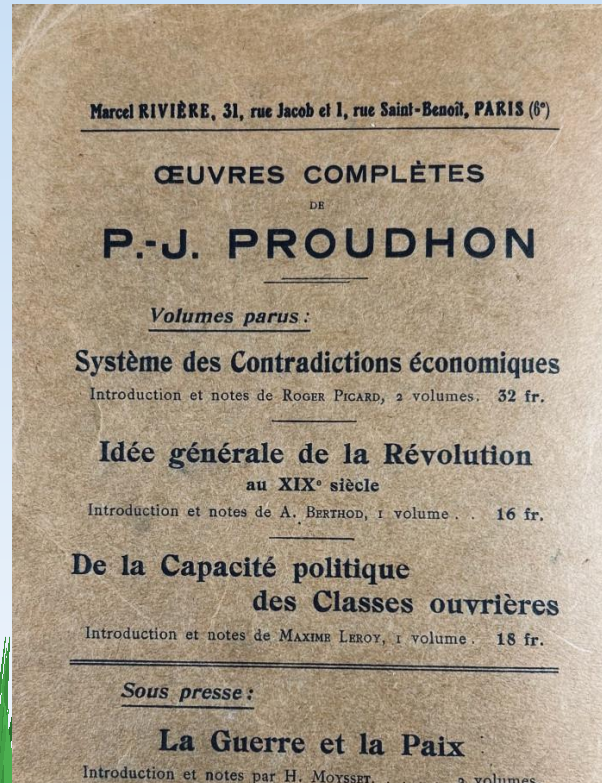
Social networks, cryptocurrencies, DeFi,  
“Sharing Economy”...

owned, operated and governed by their participants



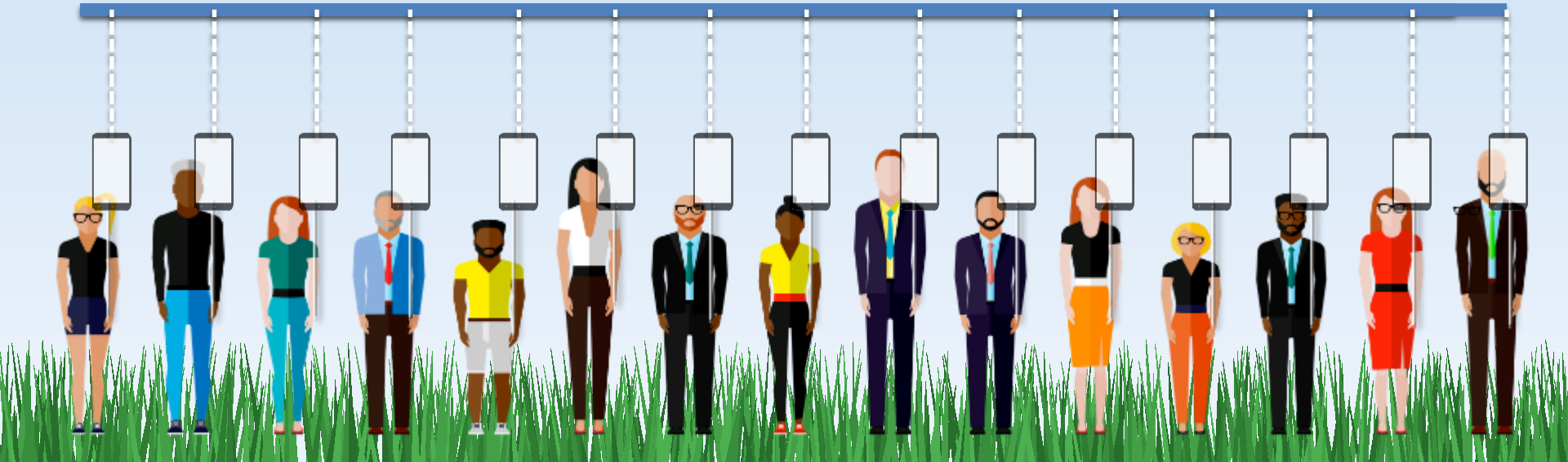
# Grassroots Platforms

## Pierre-Joseph Proudhon (1809-1865) “the first Anarchist”



# Grassroots Platforms

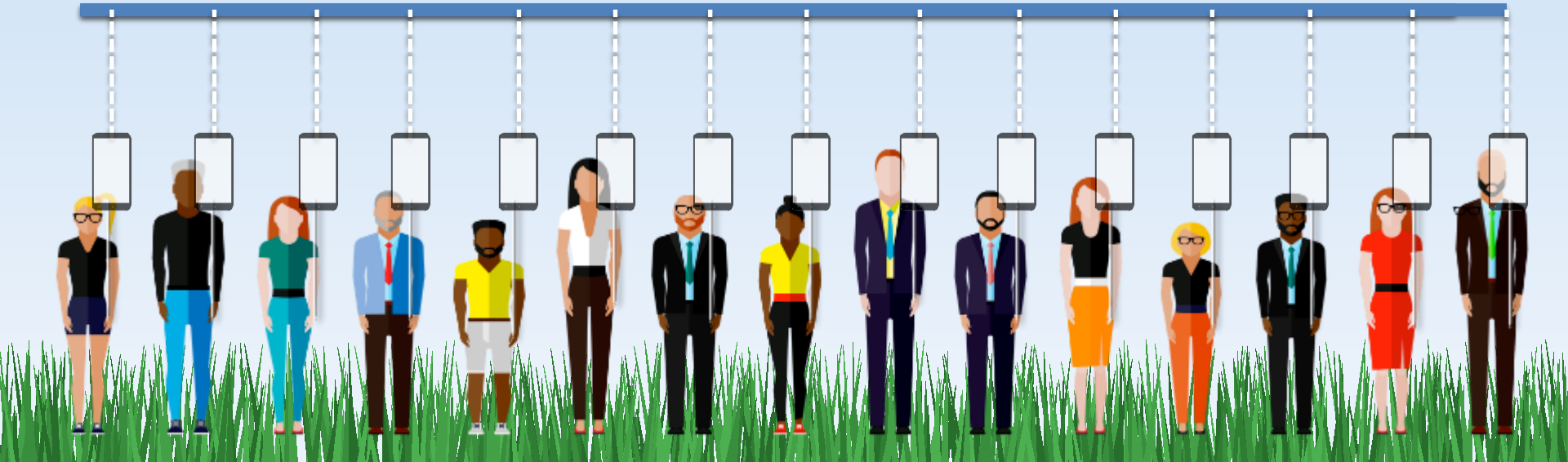
Digital incarnation of Proudhon's **social contract**:



# Grassroots Platforms

Digital incarnation of Proudhon's **social contract**:

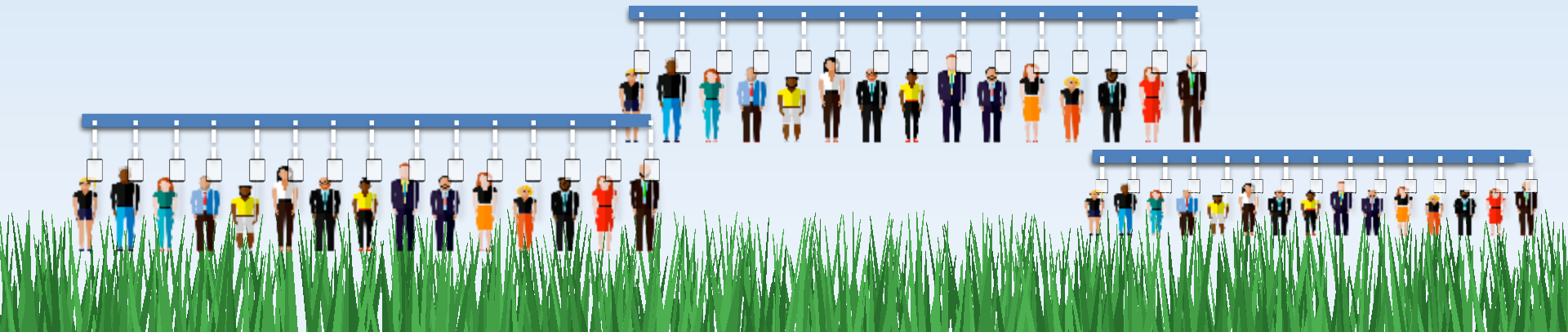
1. Multiple instances



# Grassroots Platforms

Digital incarnation of Proudhon's **social contract**:

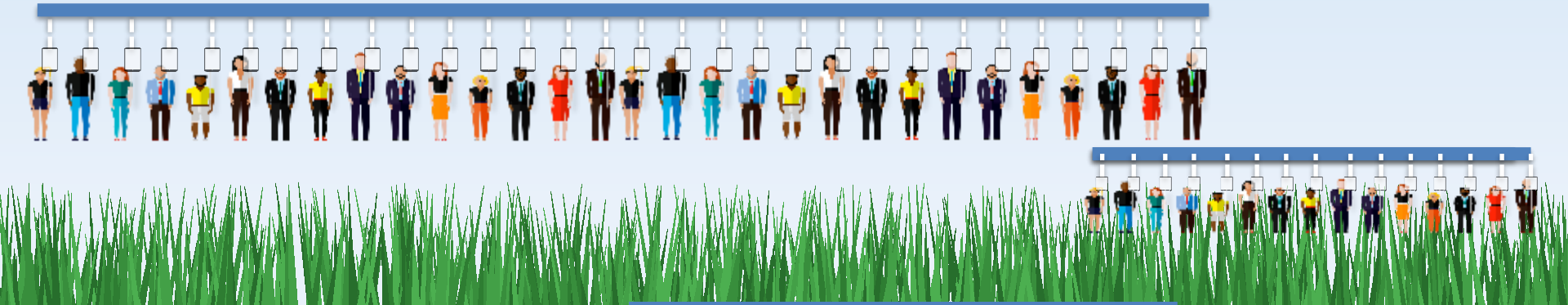
1. Multiple instances



# Grassroots Platforms

Digital incarnation of Proudhon's **social contract**:

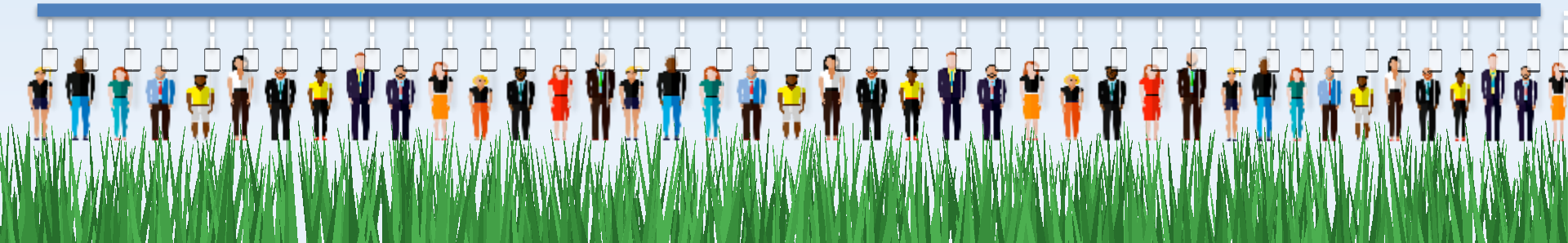
1. Multiple instances
2. May coalesce into a single instance.



# Grassroots Platforms

Digital incarnation of Proudhon's **social contract**:

1. Multiple instances
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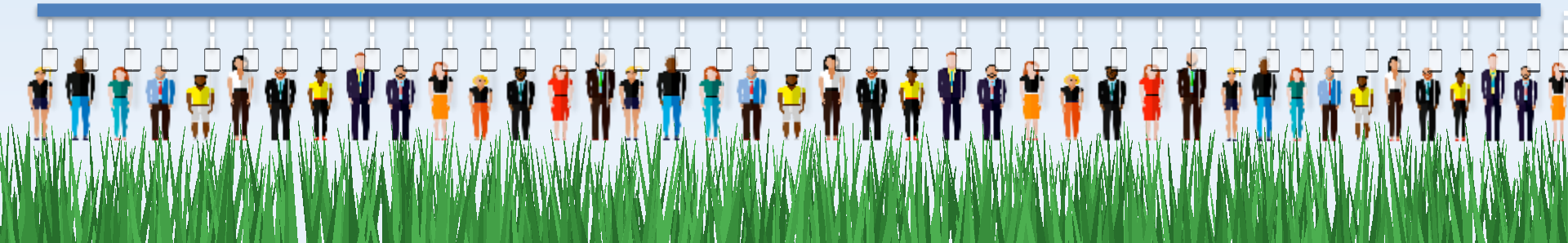


# Grassroots Platforms

Digital incarnation of Proudhon's **social contract**:

1. Multiple instances
2. May coalesce into a single instance.

**people, unlike machines, have free will**



# Grassroots Platforms

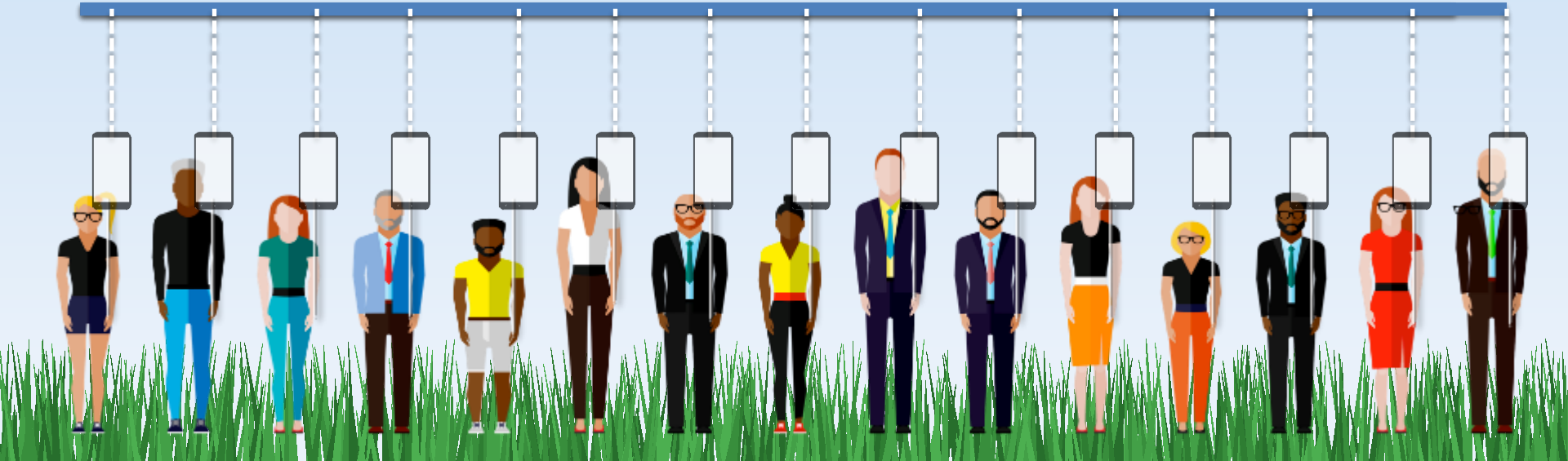
Digital incarnation of Proudhon's **social contract**:

1. Multiple **volitionally-forming** instances
2. May coalesce **by mutual consent**, possibly into a single global instance.



# Grassroots Vision: Egalitarian and Democratic Digital Realm

Build grassroots platforms competitive with  
centralised and decentralised global platforms.  
owned, operated and governed by their participants



# 10 years of paper writing...

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**Formalising and Implementing Grassroots Social Contracts: From Legal Text to Grassroots Platforms (Full Version)**

**Authors:** James Golike, Andy Lewis-Pye, Ehud Shapiro

**Abstract:** Two centuries ago Pierre-Joseph Proudhon envisioned a social contract that is (1) an agreement of man with man; (2) reciprocal; (3) imposing no obligation upon the parties except that which results from their personal promise; (4) subject to no external authority; (5) freely accepted and signed by all the participants; (6) of the nature of a contract of exchange. He also envisioned a property of s... [More](#)

**Submitted:** 13 September, 2026; **v1 submitted:** 5 September, 2026; **originally announced:** September 2026.

2. [arXiv:2609.27727](#) [\[pdf, ps, other\]](#) [econ.GN](#) [cs.DC](#) [cs.MA](#)

**Sovereign Grassroots Currencies: A CBDC Architecture for Credit and Monetary Policy (Full Version)**

**Authors:** Ehud Shapiro

**Abstract:** A Central Bank Digital Currency (CBDC) is central-bank money in digital form, held by the public. Leading designs have two limitations: conversion from bank deposits into CBDC can accelerate deposit flight, requiring safeguards, and the CBDC stays outside credit creation and monetary-policy operations. Here we present a CBDC architecture based on grassroots currencies that overcomes these limita... [More](#)

**Submitted:** 24 September, 2026; **v1 submitted:** 23 September, 2026; **originally announced:** September 2026.

3. [arXiv:2607.14138](#) [\[pdf, ps, other\]](#) [cs.PL](#) [cs.AI](#) [cs.DC](#) [cs.HC](#) [cs.MA](#)

**Volition Elicitation: Operational Semantics for People and Their Machines**

**Authors:** Ehud Shapiro

**Abstract:** The most prevalent distributed systems today include people and their personal machines (smartphones). In such systems, computations are driven by people's volitions: a payment when a person wishes to pay someone, befriending when two people wish to become friends, etc. Volition-Guarded Multitagent Atomic Transactions were proposed as an abstract specification language for such systems, in which ea... [More](#)

**Submitted:** 10 July, 2026; **originally announced:** July 2026.

4. [arXiv:2607.02304](#) [\[pdf, ps, other\]](#) [cs.DC](#) [cs.CR](#) [cs.MA](#)

**Securing People and their Machines Against Major Faults**

**Authors:** Ohad Eitan, Idit Keidar, Ehud Shapiro

**Abstract:** We consider grassroots platforms – distributed systems of agents consisting of people identified by self-chosen public keys and their machines (smartphones) – and wish to make them secure against lemph(major faults): the loss of their private keys and/or their smartphones. As grassroots platforms have no global resource to rely on for recovery, our peer-based solution is based on: (via) lempha... [More](#)

**Submitted:** 11 September, 2026; **v1 submitted:** 2 July, 2026; **originally announced:** July 2026.

5. [arXiv:2607.21189](#) [\[pdf, ps, other\]](#) [cs.PL](#) [cs.DC](#) [cs.LO](#) [cs.MA](#) [doi: 10.4204/EPTCS.450.11](#)

**GLP: A Grassroots, Multiagent, Concurrent, Logic Programming Language for AI**

**Authors:** Ehud Shapiro

**Abstract:** A grassroots platform is a multiagent distributed system in which multiple independent instances can form and operate independently of each other and of any global resource, yet may coalesce into ever larger instances, possibly resulting in a single global instance. Grassroots platforms aim to offer an egalitarian/democratic alternative to centralised/autocratic and decentralised/plutocratic glo... [More](#)

**Submitted:** 23 July, 2026; **originally announced:** July 2026.

**Comments:** In Proceedings ICLP 2026, arXiv:2607.17707

**Journal ref:** EPTCS 450, 2026, pp. 119-133

6. [arXiv:2606.19263](#) [\[pdf, ps, other\]](#) [cs.SI](#) [cs.CY](#) [cs.MA](#) [econ.GN](#)

**Digital Speech Acts Retain Control of Copyright with People, Not Platforms**

**Authors:** James Golike, Ehud Shapiro

**Abstract:** Legal precedents protect computer code as copyrightable expression. They have enabled centralized digital platforms – operating from corporate servers that hold all user data – to construct private governance regimes through the interaction of copyright, contract, and technical architecture: people who create virtually all platform value must surrender effective copyright control through Terms o... [More](#)

**Submitted:** 27 June, 2026; **v1 submitted:** 17 June, 2026; **originally announced:** June 2026.

7. [arXiv:2605.13362](#) [\[pdf, ps, other\]](#) [cs.MA](#) [cs.AI](#) [cs.DC](#) [cs.GT](#) [econ.TH](#)

**Constitutional Governance in Metric Spaces**

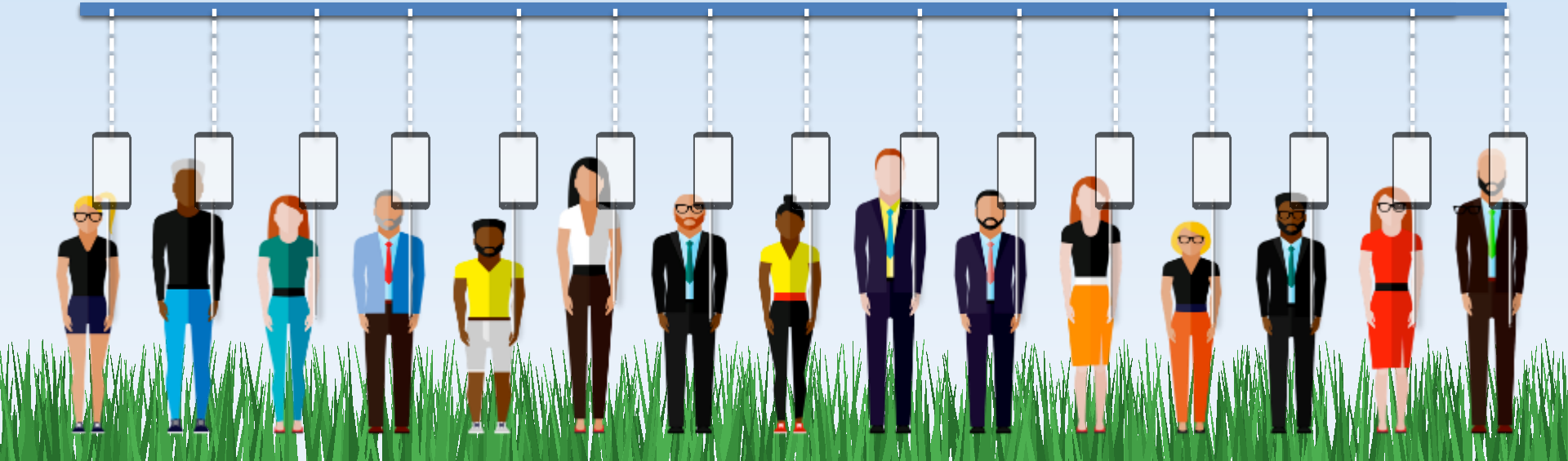
**Authors:** Ehud Shapiro, Nimrod Talmon

**Abstract:** Computational social choice and algorithmic decision theory offer rich aggregation theory but no end-to-end process for egalitarian self-governance: aggregation, deliberation, amendment, and consensus are each considered in isolation, with key metric-space aggregators being NP-hard. Here, we propose lemph(constitutional governance in metric spaces), integrating these stages into a protocol for c... [More](#)

**Submitted:** 7 July, 2026; **v1 submitted:** 13 May, 2026; **originally announced:** May 2026.

# Grassroots Vision (and plan): Egalitarian and Democratic Digital Realm

Build (with AI) grassroots platforms competitive with  
centralised and decentralised global platforms.  
owned, operated and governed by their participants



# Grassroots Platforms: Beyond Decentralisation

(Preliminary Draft)

Andrew Lewis-Pye<sup>a</sup> and Ehud Shapiro<sup>a,b</sup>

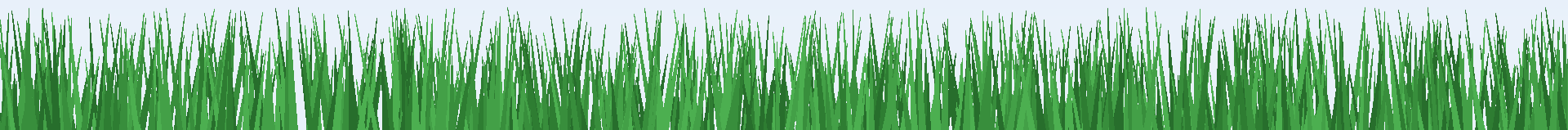
<sup>a</sup>London School of Economics, UK, and <sup>b</sup>Weizmann Institute of Science, Israel

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## Abstract

Decentralisation arose as an antidote to centralised control, with Bitcoin and Ethereum as the prime examples of decentralised global platforms. However, from the perspective of ordinary people, all global platforms—centralised and decentralised alike—appear as monolithic entities, owned, operated and governed by others.

Grassroots platforms are designed to be owned, operated and governed by their participants. They are person-to-person smartphone apps that realise Proudhon's two-centuries-old concept: A social contract that can have multiple, independent, volitionally-forming instances that may coalesce by mutual consent, possibly into a single global instance.



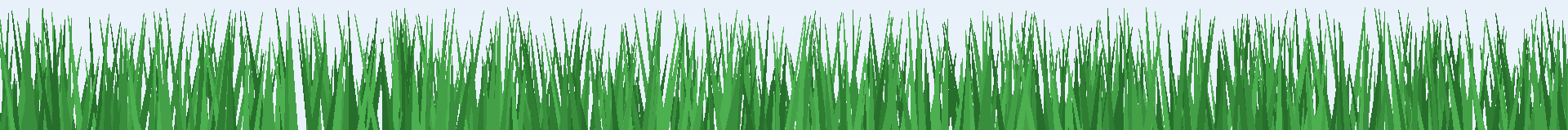
# Building Grassroots Platforms **with AI**

## 1. Human-Science-AI methodology

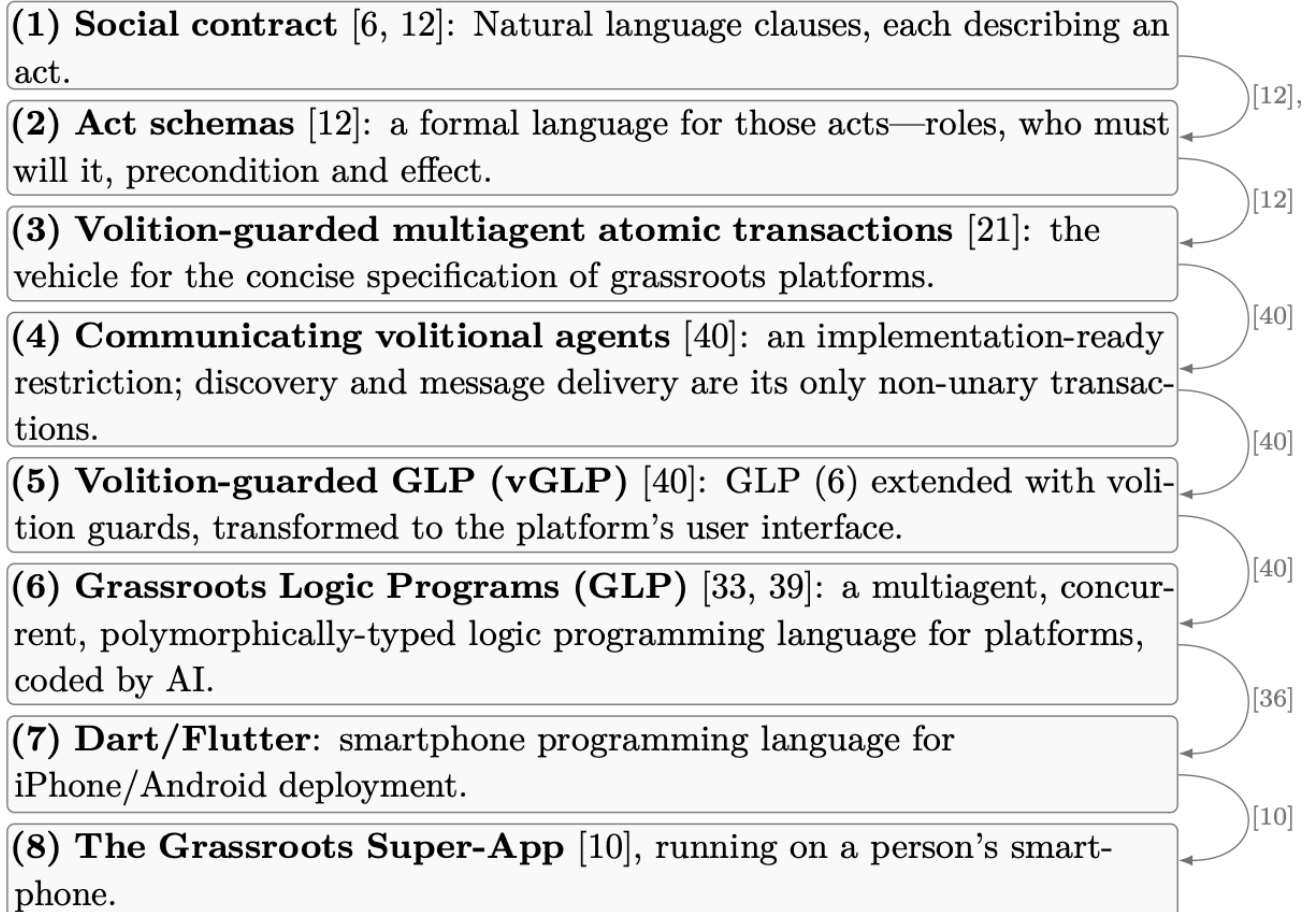
Paper is the interface between human and AI

## 2. Abstraction-Cascade programming

The antipode of vibe coding



# Figure 1: The Abstraction Cascade



# Figure 1: The Abstraction Cascade

(1) **Social contract** [6, 12]: Natural language clauses, each describing an act.

(2) **Act schemas** [12]: a formal language for the acts—roles, who will it, precondition and effect.

(3) **Volition-guarded multiagent** [12]: a formal language for the acts—roles, who will it, precondition and effect.

(4) **Communicative** [40]: a formal language for the acts—roles, who will it, precondition and effect.

(5) **Volition-guarded multiagent** [40]: GLP (6) extended with volition guards for the platform's user interface.

(6) **Logic Programs (GLP)** [33, 39]: a multiagent, concurrent, physically-typed logic programming language for platforms, by AI.

(7) **Dart/Flutter**: smartphone programming language for iPhone/Android deployment.

(8) **The Grassroots Super-App** [10], running on a person's smartphone.

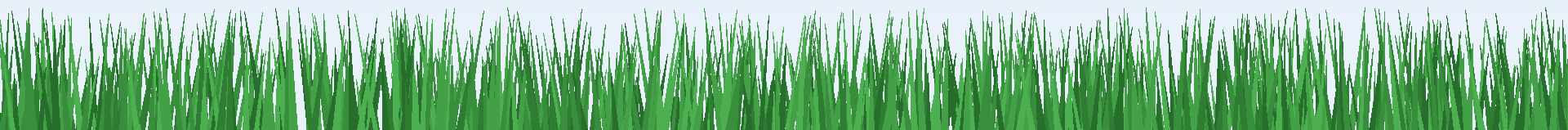
AI Coding  
the antipode of vibe coding

# Table 1: Decentralised vs. Grassroots

| Dimension            | Decentralised                                                                         | Grassroots                                                                                             |
|----------------------|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| 1. Global state      | replicated                                                                            | distributed                                                                                            |
| 2. Ledger            | blockchain, totally ordered, replicated by all operators [22]                         | attested streams, one per person, replicated by state custodians [11], interlaced into a blocklace [2] |
| 3. Operation         | miners/validators armed with high-performance servers                                 | participants armed with smart-phones                                                                   |
| 4. Trust             | trustless                                                                             | trust-based                                                                                            |
| 5. Sybil resilience  | proof of work [22]/stake [17]                                                         | grassroots social graph [23, 27, 30, 11]                                                               |
| 6. Contract          | smart contract, among accounts, operated by third-parties, requires consensus/SMR [9] | social contract [6], among people, operated by the participants, consensus as needed [14, 19, 2, 15]   |
| 7. Efficiency        | global transactions                                                                   | local transactions [30, 28]                                                                            |
| 8. Scalability       | global state synchronisation                                                          | network or federation of independent local states [42]                                                 |
| 9. Governance        | plutocratic (one coin – one vote) [5, 4]                                              | democratic (one person – one vote) [15, 41]                                                            |
| 10. Essential agents | finite ( $> 1$ )                                                                      | infinite (all but one) [32]                                                                            |
| 11. Implementation   | Bitcoin and Ethereum, deployed at global scale since 2009 and 2015 [22, 44]           | implemented and tested on a small scale [40, 10]; simulated with stochastic agents [37]; not deployed  |

# Cryptocurrencies vs. Grassroots Currencies

| Crypto      | Grassroots      |
|-------------|-----------------|
| Coins       | Coins           |
| DeFi        | Bonds           |
| Stablecoins | Sovereign coins |



# Table 2A: Crypto vs. Grassroots Coins

| Dimension                 | Bitcoin and Ether                                | Grassroots coins                                                                                                                        |
|---------------------------|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| A1. Unit and backing      | unbacked; scarcity fixed by the protocol [22]    | the issuer's debt, backed by their offerings and holdings, redeemed at par [28]                                                         |
| A2. Issuer                | the protocol, by mining or staking               | any person, natural or legal                                                                                                            |
| A3. Ledger                | one, replicated, totally ordered                 | none shared; the issuer's signed log, replicated by their state custodians for fault tolerance [19, 11]                                 |
| A4. Consensus             | on every transaction                             | none; final on the issuer's countersignature                                                                                            |
| A5. Transaction cost      | computing or locked capital, and a fee           | operating a smartphone                                                                                                                  |
| A6. Double spending       | excluded by the total order                      | excluded by the issuer's countersignature [19]                                                                                          |
| A7. Liquidity             | a market among strangers                         | mutual credit lines; payment along chains of holdings; clearing exactly when no member owes more than they hold [28]                    |
| A8. Unit of account       | one global unit                                  | one per issuer                                                                                                                          |
| A9. Loss of key or device | the holdings are lost                            | identity and log recovered from custodians [11]                                                                                         |
| A10. Implementation       | in operation at global scale since 2009 and 2015 | implemented in GLP from the contract; implemented and tested on a small scale [28]; simulated with stochastic agents [37]; not deployed |

# Table 2B: DeFi vs. Grassroots Bonds

| Dimension                      | Decentralised finance                                               | Grassroots bonds                                                                                                                                                             |
|--------------------------------|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>B1. Credit</b>              | lending pools over pooled state, over-collateralised                | a bond, the issuer's debt due at a date, redeemed at maturity against a coin [34]                                                                                            |
| <b>B2. Interest</b>            | set by the pool's protocol                                          | the discount at which coins are swapped for a bond                                                                                                                           |
| <b>B3. Instruments</b>         | smart contracts, automated market makers, flash loans [28]          | swaps: loans, sale of debt, forwards; with escrow: payment schedules, options, collateral, guarantees, insurance, credit default swaps, letters of credit, credit lines [34] |
| <b>B4. Trust</b>               | code and overcollateralisation; no counterparty known               | the counterparty; the escrow agent; an oracle where an outside event decides; each stated                                                                                    |
| <b>B5. Order and atomicity</b> | global atomicity and a global order; maximal extractable value [28] | bilateral swaps; no global order                                                                                                                                             |
| <b>B6. Time</b>                | block time                                                          | each issuer's attested date; maturity by the issuer's date                                                                                                                   |
| <b>B7. Clearing</b>            | liquidation by the protocol                                         | the community clears exactly when no member owes more than they hold, once dates advance [34]                                                                                |
| <b>B8. Implementation</b>      | lending pools and automated market makers in operation at scale     | implemented in GLP from the contract; implemented and tested on a small scale [34]; not deployed                                                                             |

# Table 2C: Stablecoins vs. Sovereign Grassroots Coins

| Dimension                                  | Stablecoins                                              | Sovereign and non-sovereign grassroots currencies                                                                                 |
|--------------------------------------------|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <b>C1. Unit</b>                            | a fiat-denominated token                                 | a debt of one fiat unit, redeemable at par [38]                                                                                   |
| <b>C2. Issuer</b>                          | one party, against reserves it holds                     | any person (non-sovereign); the central bank (sovereign)                                                                          |
| <b>C3. Backing and price</b>               | reserves; the peg held by reserves                       | redemption at par; arbitrage-free price one fiat unit while the issuer redeems; sovereign coins redeemable into fiat [38]         |
| <b>C4. Record and parties to a payment</b> | one ledger on a blockchain; the issuer mints and redeems | payer, payee and issuer; the issuer's log [38]                                                                                    |
| <b>C5. Credit creation</b>                 | none                                                     | every person, as inside money; banks issue coins in place of deposits                                                             |
| <b>C6. Interest</b>                        | none to holders                                          | bonds, sovereign and non-sovereign                                                                                                |
| <b>C7. Monetary policy</b>                 | none                                                     | the central bank lends, absorbs liquidity, sets rates, and buys and sells securities in the coins and bonds the public holds [38] |
| <b>C8. Runs</b>                            | a run on the issuer's reserves                           | a run is on one issuer and is met from their holdings; the central bank issues at its own election [38]                           |
| <b>C9. Implementation</b>                  | in operation at scale                                    | implemented and tested on a small scale [38]; not deployed                                                                        |

# Grassroots Vision (and plan):

Build (with AI) grassroots platforms competitive with centralised and decentralised global platforms.

owned, operated and governed by their participants

